[1] B. Padmanabhan *et al.* J. Magn. Magn. Mat. **307** 288 (2006).
[2] S. Rößler *et al.* IEEE Trans. Magn. **43** 3064 (2007).

TT 34.15 Thu 18:00 H 2053

Scanning tunneling microscopy and spectroscopy study of charge and orbital ordering transition in $La_{0.5}Sr_{1.5}MnO_4$ — •Grzegorz Urbanik[1,2], Paul Sass[1], Christian Hess[1], Torben Hänke[1], Bernd Büchner[1], Antoni Ciszewski[2], Pascal Reutler[3], and Alexandre Revcolevschi[3] — [1]Institute for Solid State Research, IFW-Dresden, 01171 Dresden, Germany — [2]Institute of Experimental Physics, University of Wroclaw, 50-204 Wroclaw, Poland — [3]Laboratoire de Physico-Chimie de l'Etat Solide, Université Paris Sud, Bâtiment 414, 91405 Orsay, France

The charge and orbital ordering compound $La_{0.5}Sr_{1.5}MnO_4$ has been studied by Scanning Tunneling Microscopy (STM) and Spectroscopy (STS). Cleaving of the crystal exposes flat surfaces on which atomically resolved topographic images are routinely achieved above the charge ordering temperature $T_{CO} \approx 225$ K and below (down to $T \approx 205$ K). We have studied the temperature dependence of the electronic structure both for $T > T_{CO}$ and $T < T_{CO}$. The temperature dependent STS clearly reveals finite DOS at the Fermi level for $T > T_{CO}$ and the opening of a gap $\Delta \approx 0.5$ eV just below T_{CO}. In the topographic studies we find nanometer scale modulations with various periodicity and orientations. We compare these modulations with the inherent charge and orbital ordered state of this material.

TT 34.16 Thu 18:15 H 2053

$Hg_2Ru_2O_7$, a New Magnetic Pyrochlore Showing a Metal-Insulator Transition — •Reinhard K. Kremer, Jun Sung Kim, Wilhelm Klein, and Martin Jansen — Max Planck-Institut für Festkörperforschung, D-70569 Stuttgart, Germany

The new pyrochlore compound $Hg_2Ru_2O_7$ was prepared under elevated oxygen pressure and characterized by x-ray diffraction, magnetic susceptibility, heat capacity, electrical resistivity and Hall effect measurements. $Hg_2Ru_2O_7$ undergoes a simultaneous metal-insulator and antiferromagnetic ordering transition at ∼108 K with the critical temperature decreasing under hydrostatic pressure.[1] $Hg_2Ru_2O_7$ is compared with other p-block metal oxoruthenates with pyrochlore structure which qualitatively show a very similar behavior. General trends are discussed.

[1] W. Klein, R. K. Kremer and M. Jansen, J. Mater. Chem. **17**, 1356 (2007).

TT 34.17 Thu 18:30 H 2053

Frustrated metallicity in the quasi-one-dimensional metal $PrBa_2Cu_4O_8$ — •Alessandro Narduzzo[1,2], Araz Enayati-Rad[1], Florence Rullier-Albenque[3], Shigeru Horii[4], and Nigel E. Hussey[1] — [1]University of Bristol, UK; — [2]IFW Dresden, Germany; — [3]Saclay, Paris, France; — [4]University of Tokyo, Japan.

We have investigated the metallic ground state of the extremely anisotropic quasi-one-dimensional metal $PrBa_2Cu_4O_8$ ($t_b^2 : t_a^2 : t_c^2 \sim 4000 : 2 : 1$), the non-superconducting analogue of the high-T_c cuprate $YBa_2Cu_4O_8$, as a function of disorder content, introduced either through atomic-site substitution or electron irradiation [1, 2]. A common single disorder threshold is found to drive interchain and inchain resistivities into a low temperature regime where they display $d\rho/dT < 0$. The survival of a large magnetoresistance of orbital origin reveals the itinerancy of the electronic system not to be suppressed by the presence of disorder [3]. We propose an interpretative scenario based on a microscopic electronic fragmentation of the metallic chains, though in contrast to many previous theoretical proposals, coherent hopping between chains appears to remain a relevant perturbation within the disordered system.

[1] New J. Phys. 8 (2006) 172-183; [2] Phys. Rev. Lett. vol. 99, 136402 (2007); [3] Phys. Rev. Lett. vol. 98, 146601 (2007).

TT 34.18 Thu 18:45 H 2053

Dynamics of correlated charge carriers in the close proximity to the Mott-Hubbard transition — •Michael Dumm[1], D. Faltermeier[1], S. Yasin[1], N. Drichko[1], M. Dressel[1], and J. Merino[2] — [1]1. Physikalisches Institut, Universität Stuttgart, 70550 Stuttgart — [2]Departamento de Física Teórica de la Materia Condensada, Universidad Autónoma de Madrid, Madrid 28049, Spain

We explored the dynamics of correlated charge carriers in close proximity to the Mott-Hubbard transition experimentally and theoretically in the quasi two-dimensional organic conductor κ-(BEDT-TTF)$_2$Cu[N(CN)$_2$]Br$_x$Cl$_{1-x}$ ($x = 0.73$ and 0.85). In the dc and optical conductivity data, we observe typical signatures of Fermi liquid behavior below the characteristic temperature $T^* \approx 30$ K and frequency $\nu^* \approx 400$ cm^{-1}: a T^2 and ν^2 dependence in resistivity and scattering rate, respectively and a substantial enhancement of the effective mass of the correlated carriers once we approach the metal-to-insulator transition by increasing U/t, i. e. by decreasing the Br content. The experimental results obtained by infrared spectroscopy agree well with DMFT calculations of a Hubbard model on a frustrated square lattice. Both, temperature and frequency dependence of optical conductivity and effective charge carrier number are successfully described by the theoretical model. If the temperature is increased above T^*, the Drude peak observed in the optical data at $T < T^*$ and $\nu < \nu^*$ vanishes and the optical spectral weight of the correlated carriers decreases indicating a gradual destruction of the quasiparticles.

TT 35: Transport: Nanoelectronics I - Quantum Dots, Wires, Point Contacts 3

Time: Thursday 14:00–18:30 Location: H 3010

TT 35.1 Thu 14:00 H 3010

Conductance of gold nanojunctions thinned by electromigration — •Regina Hoffmann[1,2], Daniel Weissenberger[2,3], Jacques Hawecker[2,3], Dominik Stöffler[1,2], and Hilbert v. Löhneysen[1,2,4] — [1]Physikalisches Institut, Universität Karlsruhe, 76128 Karlsruhe — [2]DFG Center for Functional Nanostructures (CFN), Universität Karlsruhe, 76128 Karlsruhe — [3]Laboratorium für Elektronenmikroskopie, Universität Karlsruhe, 76128 Karlsruhe — [4]Forschungszentrum Karlsruhe, Institut für Festkörperphysik, 76021 Karlsruhe

Electromigration can in principle be used to fabricate arrays of nanocontacts for single-molecule junctions on the same chip, in contrast to the mechanically controllable break-junction technique. With this method, a Au nanowire prepared by electron beam lithography is heated resistively until thermally activated atoms diffuse under the influence of electromigration forces. Eventually, a nanogap is formed that can host a molecule. We report conductance histograms before a nanogap is formed that show oscillations as a function of the conductance for contacts in the ballistic regime. Obviously, heating enhances the probability of the atoms to reach equilibrium positions. The oscillations of the histogram as a function of the conductance have a period of slightly less than 1 G_0. This is typical for atomic shell structures. Similar oscillations have been observed for work-hardened Au wires while annealed Au shows oscillations typical for electronic shell structures [1].

[1] I.K. Yanson et al., Phys. Rev. Lett. 95, 256806 (2005).

TT 35.2 Thu 14:15 H 3010

Fabrication of nano-electrodes by means of controlled electrochemical deposition of gold — •Conrad R. Wolf, Daniel Gerster, Klaus Thonke, and Rolf Sauer — Institut für Halbleiterphysik, Universität Ulm, 89069 Ulm

In the emerging fields of nano- and molecular electronics a strong need for nano-electrodes arises from the wish to contact objects such as quantum dots or single molecules. In this contribution we show the use of a controlled electrochemical deposition scheme to fabricate stable electrodes with spacings below 10 nm. In our experiments we start with a pair of gold electrodes separated by a 200 nm gap prepared by electron beam lithography. These electrodes are immersed into a solution of KI and I_2 in ethanol which has been saturated by dissolving gold in it [1]. Both nano-electrodes are connected to the same DC potential, while an AC voltage between them is used to in-situ monitor the conductance with a lock-in amplifier. For the deposition a DC voltage is applied to the counter electrode until the recorded conductance reaches the desired value. It is also possible to reversibly close and open the electrode gap by applying positive and negative